LIU Guiquan, HU Xiaofei, AN Guozeng and ZHAO Kai, 2014. Geological Characteristics and Genesis of Xiayingfang Gold Deposit in Pingquan, Hebei Province, China. *Acta Geologica Sinica* (English Edition), 88(supp. 2): 1464-1465.

Geological Characteristics and Genesis of Xiayingfang Gold Deposit in Pingquan, Hebei Province, China

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1 Introduction

Xiayingfang Gold deposit is located at the North margin of North China platform. Archezoic Qianxi group Lamagou hornblende gneiss, Mesoproterozoic sediments and Mesozoic volcanic sediments are exposed in mining area. The deposit was controlled by position, lithology and structure. Intermediated-acidic magma strongly activate and fault structure developed (Liu Xiwen, 1987).

2 Geological Characteristics

2.1 Mineral assemblages

Metallic minerals consist of gold, electrum, pyrite, sphalerite, galena, chalcopyrite and minor magnetite, tetrahedrite, ilmenite, tennantite, molybdenite, pyrrhotite; while non-metallic minerals are quartz, plagioclase, muscovite, sericite, potassium feldspar, carbonate minerals, fluorite, retrograde biotite, rutile, apatite and zircon.

2.2 Gold occurrence

The petrological observation and minerals microprobe analysis indicate the gold is mainly in electrum and minor natural gold. The fineness of the gold at 666-801, average is 733. Its distribution is very inhomogeneous. The gold are mainly hosted in pyrite and sphalerite, then in quarts and galena.

2.3 Ore type

(1)Veinlet like and dissemination like type ore：include strongly silicified sericite-quarzite ore, beresitizated granite porphyry ore and sericitizated granite porphyry ore.

(2) Quartz veins type ore：the width of quartz vein is less than 5 cm，most of them are between 0.5～3 cm. The length of the vein is always less than hundreds meters. If surrounding rocks of the quartz vein are granites, both side of veins always develop sericite quartzite; while if the surrounding rocks are hornblende-plagioclase gneiss, the both sides of the surrounding rocks shows chloritzation in various degree.

3 Genesis of Gold Deposit

3.1 Material source

The gold abundance of the hornblende-plagioclase gneiss has 7 times than Clarke number, while the granite porphyry has 5 times gold abundance than Clarke number, indicating the surrounding rock in mining area provide the materials source for gold deposit.

3.2 isotopic characteristic

3.2.1 S isotope

The S isotope (δS^{34}) of sulfide mineral from ore deposit is ranging from -2.10 to+4.3‰, average is +2.55‰，sample range is 6.4‰. This is very consist with magmatic S characteristic (δS^{34} 6～4‰) .

3.2.2 Pb isotope

Granite porphyry, hornblende-plagioclase gneiss and quartz-sandstone show almost similar Pb isotopic characteristic and model age, indicating the source of Pb is same. The model age is 1.0～1.1 billion years, which belong to old Pb, and this Pb has overlaid by magmatic activity at Yanshanian. These also indicate the Pb source is the old stratum, part of them is from magmatic fluid, which have been activated by later mamas, then migrated and enriched and mineralized.

The δD of the ore rock is consistent with volcanic-subvolcanic type gold deposit (-63.4～-108‰), while the δO^{18} is consistent with standard magmatic water (+5.5～+10.0‰) (Yang Tingdong, 1987). On the basis of the

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geological characteristic of ore deposit, we imply the ore-forming hydrothermal fluid is mainly from volcanic-subvolcanic rocks.

3.3 Ore-forming P-T conditions

Temperature: the homogenization temperature of fluid inclusion in quartz from ore deposit indicating the ore-forming temperature is 200 °C -300 °C (Luan Wenlou, Yu Yaoxian, 1995)..

Pressure：granite and rhyolite belong to subvocanic rocks and superhypabyssal rocks, so the ore-forming pressure should belong to low pressure conditions(Luan Wenlou, Yu Yaoxian, 1995).

The pH、Eh：the composition of fluid inclusion indicate the anion consist of predominately SO_4^{2-}, then F^-、Cl^-; while the cation have high K^+、Na^+ and low Ca^{2+}、Mg^{2+}, indicating a volcanic hydrothermal characteristic. The K^+、Na^+ are strong alkaline elements, implying the ore-forming environment is alkaline. The CH_4 in fluid inclusion and pyrite indicating ore is formed at reduced environments (Luan Wenlou, Yu Yaoxian, 1995).

Comprehensive analysis, the ore-forming conditions of gold and metallic sulfide in this ore deposit are: medium temperature, low pressure, weak alkaline and reduced conditions.

Acknowledgements

We thank Jinbao Mining co., Ltd., at Hebei Province, China and geological memoir at No. 5 Geological Party of Geology and Mineral Bureau for their constructive suggestions to this manuscript.

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